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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/727,171	12/03/2003	Takayuki Mizuno	14321.60	5976

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EXAMINER
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STEIN, JAMES D

ART UNIT	PAPER NUMBER
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2874

DATE MAILED: 01/03/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

<b>Office Action Summary</b>	Application No. 10/727,171	Applicant(s) MIZUNO ET AL. <i>ali</i>	
	Examiner James D. Stein	Art Unit 2874	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☐ Responsive to communication(s) filed on 13 October 2005.
- 2a) ☒ This action is **FINAL**.                      2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1 and 3-56 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1, 3-22 and 25-56 is/are rejected.
- 7) ☒ Claim(s) 23 and 24 is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 12-03-03 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All    b) ☐ Some \*    c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)  | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)                                   | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152)             |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)<br>Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____  |

### **DETAILED ACTION**

This Office Action is responsive to the amendment filed on 10/13/05, which has been fully considered and entered. Claims 1, 3-12, 17, 29, 35-43 and 47-49 have been amended and claim 2 has been cancelled. Claims 1 and 3-56 are pending in the application.

#### ***Response to Arguments***

Applicant's arguments with respect to the rejections of claims 1-2, 17-20, 48 and 56 have been considered but are moot in view of the new ground(s) of rejection.

#### ***Response to Amendment***

The indicated allowability of claims 9-16, 21-22, 25-28, 33-34, 39, 41, 43-47, 49, 51-52 and 54-55 are withdrawn as a result of the amendments to the claims in view of the newly cited reference to Takiguchi. Rejections based on the newly cited reference follow. Applicant's amendment changed the scope of the claims and therefore necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL.**

#### ***Claim Objections***

The objections to claims 9-12 have been withdrawn as a result of the amendment.

#### ***Claim Rejections - 35 USC § 102***

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

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((b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 1, 5-6, 9-10, 13-14, 17, 19, 21, 25, 27, 48, 50 and 56 are rejected under 35

U.S.C. 102(b) as being anticipated by [EP 1 094 625 A2] (also published as [USPAT 6,912,362]) to Takiguchi et al. ("Takiguchi"), which discloses a related optical circuit with a phase generating function.

With regard to claim 1, fig. 2 of Takiguchi shows a MUX/DMUX circuit with a phase generating function comprising: one or more optical multi/demultiplexing devices (8a-8f) including at least one input section and a plurality of output sections; a plurality of optical delay line devices (top curved waveguides) interposed between each of the optical multi/demultiplexing devices (8a-8f); and characterized in that at least one of said optical multi/demultiplexing devices (8a-8f) or optical delay line devices (top curved waveguides) includes a phase generating device (9a-9e), wherein said phase generating device (9a-9c) generates a wavelength-dependent phase corresponding to a wavelength or frequency of light in a passband of said optical multi/demultiplexing circuit (at least ¶0041).

With regard to claims 5-6, in addition to the rejection of claim 1 previously discussed above, Takiguchi teaches the wavelength-dependent phase is generated by setting respective coupling ratios (coefficients) of the couplers (at least ¶'s 0041, 0044, 0045) and the respective optical path length differences of the optical delay lines (at least ¶0030).

With regard to claims 9-10, in addition to the rejections of claims 5 and 6 previously discussed above, all subject matter claimed is inherent to the disclosure discussed above. It is noted that Takiguchi teaches "equalization" of the transmission spectrum is accomplished with

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wavelength-dependent phase (see entire document, ¶'s 0030, 0041, 0044, 0045). This is analogous to "correct[ing]" the transmission spectrum, as claimed by applicant.

With regard to claims 13-14, in addition to the rejections of claims 9 and 10 previously discussed above, fig. 2 of Takiguchi shows the phase generating devices (M+1) couplers and M optical delay lines interposed between adjacent two of said couplers. In the arrangement shown in the figure, M=5.

With regard to claims 17, 19 and 21 in addition to the rejections of claims 1, 6 and 14 previously discussed above, fig. 2 of Takiguchi and interferometer (MMI) arrangement (two waveguide arms with a coupling section between the waveguides, see ¶0030). Fig. 2 show interferometers comprise the (N+1) optical multi/demultiplexing devices (8a-8f) and N optical delay lines (top curved waveguides) interposed between adjacent two of said optical multi-demultiplexing devices, wherein N=5. In the arrangement shown in the figure, N=5.

With regard to claims 25 and 27, in addition to the rejection of claim 21 previously discussed above, fig. 2 of Takiguchi shows said optical multi/demultiplexing circuit to consist of a Mach-Zehnder interferometer including two of said optical multi/demultiplexing devices (8a and 8b), said optical delay line device (curved waveguide) interposed between said two optical multi/demultiplexing devices, at least one input waveguide connected to one of said optical multi/demultiplexing devices 8a, and at least one output waveguides connected to the other of said optical multi/demultiplexing 8b devices, and wherein one of said two optical multi/demultiplexing devices is a phase generating optical coupler, which functions as a phase generating device (see discussion above); and said phase generating optical coupler includes

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(M+1) optical couplers, and M optical delay lines each interposed between adjacent two of said optical couplers, where M is an integer equal to or greater than two. M=2 in this arrangement.

With regard to claim 48, in addition to the rejection of claim 5 previously discussed above, because the optical delay line (top curved waveguide) of Takiguchi introduces a wavelength dependent phase delay, it inherently comprises a birefringent adjustment device, as claimed by applicant. A wavelength dependent delay is, in fact, the definition of birefringence.

With regard to claim 50, in addition to the rejection of claim 1 previously discussed above, Takiguchi teaches silica-based waveguides (see entire document).

With regard to claim 56, in addition to the rejection of claim 1 previously discussed above, fig. 2 of Takiguchi shows the output of the first multi/demultiplexing device may be connected to the input of a second demultiplexing device in order to further compensate for dispersion at different wavelengths.

### ***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 3-4, 7-8, 11-12, 15-16, 18, 20, 22, 26, 28, 47, 49, 51-52 are rejected under 35 U.S.C. 103(a) as being unpatentable over Takiguchi, as applied to claim 1 previously discussed above.

With regard to claims 3-4, the claimed invention has been disclosed and previously discussed above except for the phase generating devices (9a-9e) to incorporate a 2<sup>nd</sup> order (quadratic) or higher order function. Takiguchi teaches that higher order dispersion (inherently dependent on wavelength) is a problem (¶0003) and suggests that the invention is aimed at compensating for such dispersion (¶0006). Although Takiguchi does not specifically teach that the phase generating devices (9a-9e) generate phase according to a second or higher order polynomial function, it would have been obvious at the time of the invention to include this feature. The motivation would be to compensate for second and higher order dispersion, which Takiguchi teaches is prevalent in DSF WDM systems and compromises optical signal integrity by introducing distortion.

With regard to claims 7-8, in addition to the rejection of claims 3 and 4 previously discussed above, Takiguchi teaches the wavelength-dependent phase is generated by setting respective coupling ratios (coefficients) of the couplers (at least ¶'s 0041, 0044, 0045) and the respective optical path length differences of the optical delay lines (at least ¶0030).

With regard to claims 11-12 and 47, in addition to the rejections of claims 7 and 8 previously discussed above, all subject matter claimed is inherent to the disclosure discussed above. It is noted that Takiguchi teaches "equalization" of the transmission spectrum is accomplished with wavelength-dependent phase (see entire document, ¶'s 0030, 0041, 0044, 0045). This is analogous to "correct[ing]" the transmission spectrum, as claimed by applicant.

With regard to claims 15-16 in addition to the rejections of claims 11 and 12 previously discussed above, fig. 2 of Takiguchi shows the phase generating devices (M+1) couplers and M

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optical delay lines interposed between adjacent two of said couplers. In the arrangement shown in the figure,  $M=5$ .

With regard to claims 18, 20 and 22, in addition to the rejections of claims 4, 8 and 16 previously discussed above, fig. 2 of Takiguchi and interferometer (MMI) arrangement (two waveguide arms with a coupling section between the waveguides, see ¶0030). Fig. 2 show interferometers comprise the  $(N+1)$  optical multi/demultiplexing devices (8a-8f) and  $N$  optical delay lines (top curved waveguides) interposed between adjacent two of said optical multi/demultiplexing devices, wherein  $N=5$ . In the arrangement shown in the figure,  $N=5$ .

With regard to claims 26 and 28, in addition to the rejection of claim 22 previously discussed above, fig. 2 of Takiguchi shows said optical multi/demultiplexing circuit to consist of a Mach-Zehnder interferometer including two of said optical multi/demultiplexing devices (8a and 8b), said optical delay line device (curved waveguide) interposed between said two optical multi/demultiplexing devices, at least one input waveguide connected to one of said optical multi/demultiplexing devices 8a, and at least one output waveguides connected to the other of said optical multi/demultiplexing 8b devices, and wherein one of said two optical multi/demultiplexing devices is a phase generating optical coupler, which functions as a phase generating device (see discussion above); and said phase generating optical coupler includes  $(M+1)$  optical couplers, and  $M$  optical delay lines each interposed between adjacent two of said optical couplers, where  $M$  is an integer equal to or greater than two.  $M=2$  in this arrangement.

With regard to claim 49, in addition to the rejection of claim 11 previously discussed above, because the optical delay line (top curved waveguide) of Takeguchi introduces a



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wavelength dependent phase delay, which inherently comprises a birefringent adjustment device, as claimed by applicant. A wavelength dependent delay is, in fact, the definition of birefringence

With regard to claims 51-52 in addition to the rejections of claims 11 and 47, Takiguchi teaches silica-based waveguides (see entire document).

Claims 29-34 are rejected under 35 U.S.C. 103(a) as being unpatentable over Takiguchi as applied to claims 1, 4, 6, 8, 14 and 16 as previously discussed above, and further in view of [USPAT 6,856,724] to Bohn et al. ("Bohn"), which discloses a related optical MUX device with dispersion compensation. Takiguchi discloses the claimed invention except for the optical multi/demultiplexing device to consist of a transversal-form filter. Bohn et al. teach that a transversal filter may be employed in order to compensate for dispersion in all channels of a WDM system simultaneously; therefore reducing the complexity of the system (col. 1 lines 35-45). Therefore, it would have been obvious at the time of the invention to one of ordinary skill in the art to modify the device as taught by Takiguchi to include a transversal-form filter in order to compensate for dispersion in all channels of the system simultaneously and reduce the complexity of the system.

Claim 35-46 are rejected under 35 U.S.C. 103(a) as being unpatentable over Takiguchi or Takeguchi/Bohn as applied to claims 1, 3, 4, 12, 20, 22, 32 and 34 previously discussed above, and further in view of [USPUB 20020044742] to Yoneda, which discloses a related arrayed waveguide grating device. The claimed invention has been disclosed and previously discussed above except for light waves to be received or emitted by slab waveguides and the arrayed waveguide grating includes waveguides having their first ends connected to the first slab waveguide 69 and their second ends connected to the second slab waveguide. Fig. 5 of Yoneda

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shows light waves to be received or emitted by slab waveguides 69 and 71. The arrayed waveguide grating includes waveguides having their first ends connected to the first slab waveguide 69 and their second ends connected to the second slab waveguide 71. Therefore, it would have been obvious at the time of the invention to one of ordinary skill in the art to modify the invention as disclosed by Takiguchi to include first and second slab waveguides as taught by Yoneda in order to facilitate an increased number of output-side channels or to provide a monitoring output terminal (abstract).

Claims 53-55 are rejected under 35 U.S.C. 103(a) as being unpatentable over Takiguchi et al. as applied to claims 1, 51 and 52 above, and further in view of [USPUB 20040008927] to Kowalkowski et al. Takiguchi discloses the claimed invention except for the multi/demultiplexing device to be installed in a casing, having optical fibers held by the casing carry out input and output of an optical signal to and from the multi/demultiplexing device. Kowalkowski discloses a multiplexing device wherein the multiplexing device is held in a housing and the optical fibers are connected thereto in order to facilitate interconnection to a host device or system [0009]. Therefore, it would have been obvious at the time of the invention to modify the device as disclosed by Takiguchi such that the multi/demultiplexing device is installed in a casing, having optical fibers held by the casing carry out input and output of an optical signal to and from the multi/demultiplexing device in order to protect the device and facilitate interconnection to a host device or system.

***Allowable Subject Matter***

Claims 23-24 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims. None of the cited prior art discloses or suggests the multi/demultiplexing circuit as discussed above wherein said optical multi/demultiplexing circuit consists of a Mach-Zehnder interferometer including two of said optical multi/demultiplexing devices, said optical delay line device interposed between said two optical multi/demultiplexing devices, at least one input waveguide connected to one of said optical multi/demultiplexing devices, and at least one output waveguides connected to the other of said optical multi/demultiplexing devices, and wherein said two optical multi/demultiplexing devices are disposed in left-right symmetry with respect to a middle line of said Mach-Zehnder interferometer; said two optical multi/demultiplexing devices are a phase generating optical coupler, which functions as a phase generating device; and said phase generating optical coupler includes four optical couplers, and three optical delay lines each interposed between adjacent two of said optical couplers.

***Conclusion***

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after

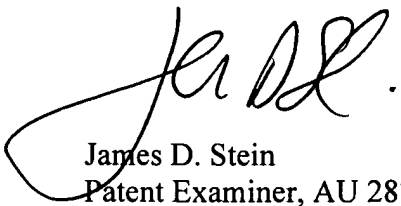
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the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

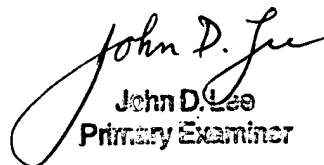
Any inquiry concerning this communication or earlier communications from the examiner should be directed to James D. Stein whose telephone number is (571) 272-2132. The examiner can normally be reached on M-F (8:00am-4:30pm).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Rodney Bovernick can be reached on (571) 272-2344. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



James D. Stein  
Patent Examiner, AU 2874



John D. Lee  
Primary Examiner